VoCard: An Effective Approach to English Vocabulary Acquisition

Min-Ji Kim, Chang-Woo Kang, Young Joon Eo, Ye-Hyun Jo

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Abstract

This paper introduces "Vocard," our approach in solving some of the problems posed by current vocabulary learning mobile applications. It aims to introduce the importance of vocabulary learning as well as the problems that we plan on addressing with our approach. Appropriate solutions will be introduced with the usage of popular AI tools such as ChatGPT and Dall-E. These tools will help the service provide real-time feedback of user generated sentences and novel generations of word-appropriate illustrations. This system will also provide a notification system based on the Forgetting Curve to help users retain knowledge through spaced repetition.

1 Introduction

In the modern day, almost every individual in developed countries has access to a smartphone. The ability for a handheld device to provide Internet connectivity has allowed for a variety of functionalities to be introduced to the individual on an everyday basis. This capability gave rise to the freely accessible application store where users can download and install applications that suit their needs. Users can download applications related to business, efficiency, school work, and entertainment to name a few. Among the numerous categories of applications, Education holds a top spot in both Apple's App Store and the Google Play Store. In the App Store, Education ranks as the third most popular category [3], whereas on the Google Play Store it ranks as the second most popular category [4]. Indeed, in the Google Play Store, the number of Education-related applications exceeds 400,000 [1] and in the App Store exceeds 170,000 [2]. With this information in mind, it is clear to state that many users seek to achieve some education-related goals through these applications. One subcategory that holds great popularity is language learning. Within this subcategory too are various category spanning from all-in-one language learning to vocabulary-focused or speech-focused. Our team aims to enter into the

category of vocabulary learning, specifically English vocabulary. As students who have to prepare for English certification tests, we personally encountered many problems and difficulties using currently available English vocabulary-learning applications. Many applications feature word sets with similar UI/UX, which makes the process monotonous and dull. Additionally, the users must see the vocabulary word, try to guess their meaning and manually track words that they have not been able to memorize. Most applications also do not test the user's knowledge in a meaningful way, making the user determine the level of acquisition of a certain word on their own. However, we propose a better vocabulary acquisition experience with the help of AI tools such as ChatGPT and Dall-E. Through these tools we will be able to develop an intuitive system that allows users to learn new vocabulary words with the help of quizzes, real-time evaluated user-generated example sentences, illustrations and a system that tracks the level of a user's familiarity and acquisition of a certain word.

2 Motivation & Objectives

2.1 Motivation

2.1.1 Interest in Language Learning through Mobile Apps

As briefly discussed in the Introduction section, the number of education applications available for Android and IOS is staggering. Of this number are many language-learning focused education applications.
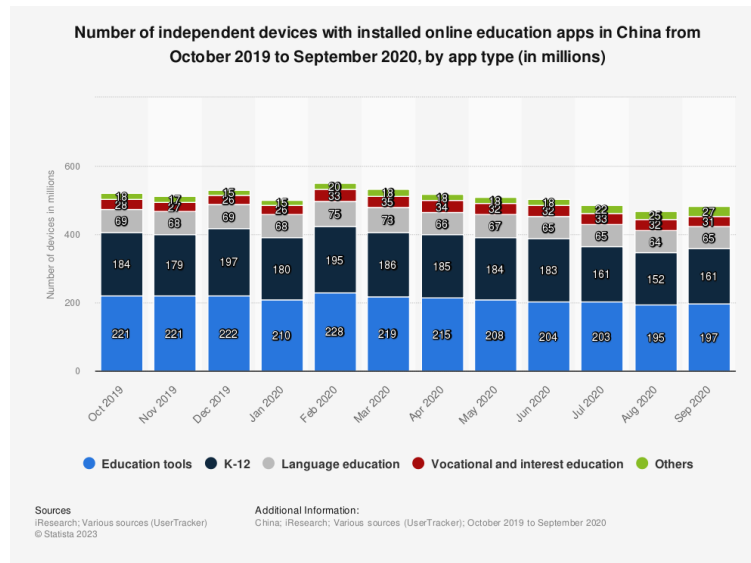

Figure 1: Number of education application downloads in China

This small segment of the Chinese market alone shows 65 million language education application downloads just from the month of September 2020[5].

Time spent on educational apps in India in 2022, by subgenre (in million hours)

Subgenre	Time spent in million hours
Primary & secondary education	951.3
Learning management	795.89
Higher education	681.49
Professional education	655.67
Language learning	186.91
Early childhood learning	83.76
Parent-teacher communication	71.1
Other education	16.48
Children companionship	8.13
Educational hobbies	2.99

Source
Data.ai
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Additional Information:
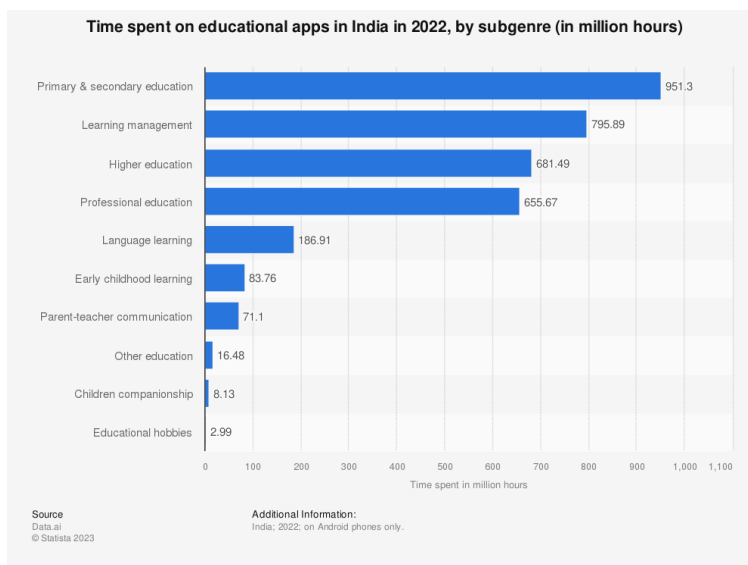India; 2022; on Android phones only.

Figure 2: Number of hours spent on educational apps in India in 2022

This figure is another cross section of the amount of time that users spend on education applications. It shows that Indian users 186 million hours into language-learning applications in 2022 [6]. The examples that show China and India are relevant since it can be deduced that the majority of the users in these markets are trying to learn English.

2.1.2 Problems in Current Approaches

Existing English vocabulary learning applications divide words by groups, or "chapters" and ask the user to keep track their progress in a chapter. For example, if a user is practicing a chapter of ten words, the user must check off the word either mentally or on the application that they have learned a certain word. This approach poses two problems: how can the user know if their vocabulary is actually improving and can actually use the word in a meaningful way? It seems necessary to develop solutions that provide the user with an automated way of tracking their progress and testing their knowledge of vocabulary that they have already encountered.

2.2 Objective

The objective of our project is to address some of the shortcomings that we have personally perceived when using vocabulary-learning applications. Primarily we plan on addressing the two problems discussed in the previous subsection:

tracking and testing a user's progress. We plan on reaching a solution through the help of widely popular AI tools, specifically ChatGPT and Dall-E. The main focal point for utilizing ChatGPT is to support the feature of allowing the user to make their own example sentence. ChatGPT will analyze the sentence in real-time and evaluate the correctness of the sentence. Dall-E will be used to provide illustrations for vocabulary words to make the memorization process a little more enjoyable. Our system will utilize a "card stack" where users will be able to choose whether they know the presented word or not. If they do know the word, a quiz will be prepared and the result will affect the internal score the system keeps track of on a word-by-word basis. If they do not know the word, this internal score will also be affected so that the user sees this word again in the near future.

3 Background & Related Work

3.1 Language Learning and Vocabulary

The need for communication between different groups of people has been prevalent since time immemorial. Throughout the decades different approaches to second language (L2) learning has been used to facilitate language learning in non-native learners. From rote memorization of grammar rules to an environmentally dynamic approach, theories of language learning has been in constant change as a result of more studies and technological advancements. However, one core aspect of language learning has not seen much change in its approaches: vocabulary learning. Many modern approaches stress the importance of facilitating an environment that closely resembles the native environment of the language. This environment must be one where all of the major language skills, speaking, writing, reading and listening, must be present. These approaches also place great emphasis in speaking since practical usage of the language quickens the process of learning said language. However, to participate in this kind of environment requires some knowledge of both grammar and a minimal working set of vocabulary. In an English as a second language context, lower level learners will often times find difficulty in expressing themselves due to their lack of vocabulary. In order to overcome this difficulty, learners will incorporate vocabulary learning in their studies. The approach they utilize can vary depending on their style of learning that range from rote memorization to practical stimulation in real world environments. Despite the varying number of strategies a learner can choose from it seems prudent to utilize modern technology to further enhance the learning experience. There is evidence that utilizing multimedia tools in vocabulary learning can be very beneficial. In a study conducted on a group of English L2 learners using the online resource, Quizlet, learners were able to better recall their words than the control group [9]. This supports Mayer's generative theory of multimedia learning which states that if learners are concurrently exposed to verbal and visual information, the probability of recalling the learned information increases [8]. Therefore, we plan on utilizing

this background in creating our vocabulary learning system.

3.2 Related Work: 암기고래

Because we are developing a mobile application, it seems correct to narrow our scope to the realm of other vocabulary focused language learning applications. The most closely related application to our idea is a Korean app called 암기고래. Although this application goes beyond the scope of vocabulary learning, only this aspect will be highlighted so as to remain consistent with the scope of this project. This application features preconstructed wordsets for a variety of categories spanning from elementary-level to more practical categories such as business and travel. A wordset contains thirty-one days worth of vocabulary lists where users can go through the provided list for that certain date. The user are able to freely go through the list without consideration of the date. For example, a user can go through "Day 1" through "Day 10" in one sitting if they choose to do so. On a word-basis, this application features an illustration, phonetic pronunciation and example sentences in English and Korean. It also features a human speaker who pronounces the word and states the definition and example sentence of said word. There is also a quiz feature where users can test different aspects of their knowledge of a word. This feature provides two types of quizzes, a spelling and definition pairing quiz, and the user is able to choose freely between the two.

Figure 3: Example of categories and wordsets in 암기고래

4 Problem Statement

Vocabulary learning functionalities in language learning applications suffer from a variety of problems that inhibits or harms the user's learning experience. In

some cases, development costs can inhibit the scope of functionalities that can be implemented and thus limit the effectiveness of an application. Below we outline some of the major problems that current applications face in their development and functionalities.
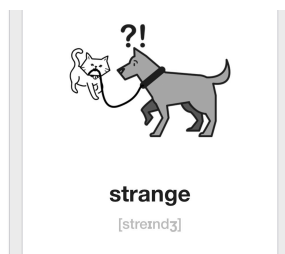
4.1 Development Costs

Figure 4: Example of a word-illustration pair on 암기고래

There are illustrations featured on every vocabulary entry. These illustrations try to provide visual feedback to help users understand the vocabulary word they are learning better. One Listing on a part-time service platform by the developers of 암기고래 show that they incur costs of at least 1000 Won per illustration. Due to this cost, there is almost no diversity in the illustrations associated with any vocabulary word. A lack of diversity could induce stimulus drought where the user will no longer be able to gain any sort of useful insight or understanding through visual feedback. Additionally, the example sentences provided to the user also involve human cost as they must find or create a relevant sentence for the word.

4.2 Lack of Practical Vocabulary Usage

One significant issue in language learning and memorization in general is not applying the new vocabulary into meaningful, practical usage. A classic way of helping students learn vocabulary is by making example sentences with the newly introduced word. 암기고래, however, does not provide users with this opportunity and rather simply shows an example sentence. This method is no different from just memorizing the word and there is no useful application of the newly encountered word.

4.3   Deficient Review Functionalities
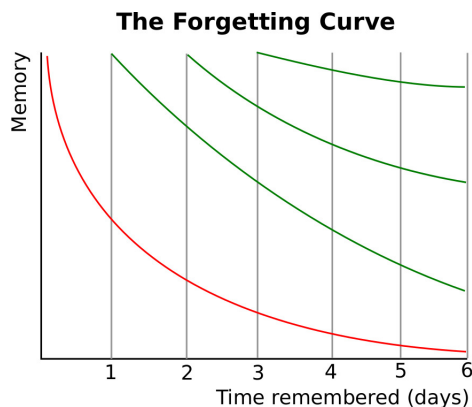
The Forgetting Curve

Figure 5: Forgetting Curve with Spaced Repetition

A third problem that consistently shows up in many language learning applications in general is the lack of "review sessions."Users are expected to, on their own, review things that they have learned. Due to the nature of being a mobile application, it is easy for a user to get distracted and become forgetful in engaging in review at all. According to the Forgetting Curve, the average person faces complete loss of memory retention within 6 days of experiencing a new material if they do not engage in review. With spaced repetition using active recall, information can be transferred from short-term to long-term memory[7]. Using the insight provided by this theory, users could be delivered notifications within a 24 hour period to engage in review. Push notifications could be used to strongly suggest the user to engage in review of the material that they engaged in the day prior. Notifications would delivered until the 6th day or until the user manually disables notifications for certain words.

5   Proposed Solution

Based on the previously mentioned problems, we propose a service called *Vocard*. The key features of *Vocard* are as follows.

5.1   Sentence Generation and Correction

In our application, ChatGPT performs two important tasks:

1. Example sentence generation/translation for English words : ChatGPT generates example sentences for English words with Korean meanings corresponding to English words.

2. User Generated Sentence Evaluation and Modification : Users can submit sentences they create, and ChatGPT evaluates and corrects based on grammar, vocabulary, and context.

The application receives user feedback because the sentences and translations provided by ChatGPT may not always match your preferences. User feedback is utilized to update the database, adding well-received word-example-meaning pairs or removing unsatisfactory pairs. As the service continues to operate, the database will consist of word-example-meaning pairs that users have found valuable, reflecting their judgments of usefulness.

5.2 Word Image Generation

DALL-E is an AI model provided by OpenAI that translates text into images. *Vocard* utilizes DALL-E, enabling users to generate illustrations for word-example pairs in their desired style. However, due to diverse user preferences, the generated images may not always meet their expectations. To address this, feedback plays a pivotal role. Users can provide feedback on the generated images, allowing for re-creation in case of dissatisfaction or removal from the database. Incorporating user feedback into both sentence generation and image creation processes ensures a tailored and satisfying user experience.

5.3 Review

Push notifications will be used to prompt the user to engage in review. The timing for these notifications will be some time within 24 hours of learning a word. This timing can be manually set by the user within the 24 hour time frame. If the user chooses not to change the timing, the default setting will be set to random. To avoid the potential problem of spamming the user with multiple notifications for each individual word, words will be bundled into groups so that the user gets a notification depending on for words that should be reviewed within a certain time frame. For example, the user could get a notification to review a group words that should be reviewed within 1-6 hours. This process repeats to encourage spaced repetition and gets turned off after 6 days.

5.4 Test

In TOEIC exams, assessing knowledge of English words often involves providing multiple answer choices for fill-in-the-blank questions, with one of them being correct. Similarly, our application offers one correct answer and several incorrect words for each question. Each word-based quiz is stored in the database and can be created or deleted based on user evaluations. When users click the 'Thumbs Up' button, the probability of a quiz appearing increases. If the ratio of 'Thumbs Down's exceeds a threshold, the quiz is removed from the database.

6 Project Planning

6.1 Role Distribution

In our team, we have planned the project roles in relation to our chosen technologies. The design tasks will be carried out using Figma to create the user interface and overall visual aesthetics. The iOS application development will be conducted using Swift, on the back-end, we will employ Django, to manage the server and handle data efficiently.

Name	Role
Min-Ji Kim	Design
Chang-Woo Kang	iOS, AI
Young Joon Eo	Back-end, AI
Ye-Hyun Jo	iOS

Table 1: Role of Each member

6.2 Schedule

The following table outlines a brief schedule for our team project. Starting from week 6, we will initiate the main development phase, with a focus on effective communication between the front-end and back-end teams. During weeks 12 to 13, we plan to conduct continuous testing to ensure a high level of completion and quality in our work.

	W5	W6	W7	W8	W9	W10	W11	W12	W13
Design	WireFrame	Design	Design						
Front-end		UI		API				TEST	
Back-end		DB schema	API					TEST	

Table 2: Table of Weekly Plan

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